Pollution Prevention/Waste Minimization - Minimizing Waste Materials During Building Demolition

During fiscal year 2004 Brookhaven National Laboratory (BNL) recycled a total of 7195 metric tons. One recent initiative, which contributed to roughly half of this amount, was the segregation and subsequent recycling of materials derived during building demolition. During the year 3 warehouse areas were demolished (buildings 206, 207, 208) with a capacity of approximately 465615 ft3. Prior to the demolitions, a committee consisting of Plant Engineering, Supply and Material, Health Physics, Industrial Hygiene and Environmental and Waste Management Services personnel was formed. The goal of this committee was to provide a plan for the pending demolitions in a systematic, environmentally friendly, safe and efficient manner. The committee established the following guidelines, which served as the blueprint for conducting demolition work in safe and efficient manner with built in commitments to safety, pollution prevention/waste minimization and cost savings:

1) Coordinate with the Building Manager, replace exterior locks and post "Warning Signage"
2) Coordinate the initial walk-through review with Plant Engineering personnel to see what structures/components can be removed and reused thru-out the Lab (i.e., overhead cranes, roll-up doors, etc…)
3) Review historical structure usage to determine potential of any safety/environmental concerns. Also visually inspect the building and drawings keying in on heating systems, electrical systems, scientific/office environments, fire protection and detection systems and the overall condition of the building.
4) If laboratories exist in the buildings, remove all sink traps (checking for mercury) and based on historical knowledge (obtained from step two) survey or remove lab hoods (if known contamination – if unknown, survey the hood).
5) Remove all environmental building operational hazards. This includes, all mercury switches, thermostats and thermometers, any PCB laden transformers and lighting ballasts, and all mercury activated fluorescent bulbs, charged AC units and any associated underground storage tanks. Coordinate removals and disposal with Waste Management.
6) Disconnect services (electrical, steam, HVAC, telecommunications, computer systems, etc…). Timing on this is important, for example don't shut down steam (or heating system) until the water system has been shut down. Shutdown and disconnect fire detection and protection systems after contacting the Fire Rescue Group. Sample condensate drains on static room A/C units for Legionnaires disease. Shutting down electricity grants access to electrical systems, but then generators are needed for lighting and power.
7) Trades remove items they wish to recover, identified during step 2 (steam traps, condensate pumps, automatic flush valves, overhead doors, overhead cranes, etc…)(NOTE: during removals and shutdowns there are many safety concerns which have to be addressed, such as: confined space, working hot, fall protection, and radiation areas.)
8) Remove all friable, or potentially friable, asbestos materials (pipe coverings, siding, transite panels, roofing and floor shingles) and contract for waste hauling
9) Once actual demolition starts segregate construction debris into three separate waste streams; metals (conduit, trays, HVAC. etc. – to be recycled), concrete/masonry/foundation (can be recycled as aggregate) and remaining construction and demolition debris (wood, non-asbestos shingles, etc.) - See Figure 2. Structure should be kept wet during demolition to reduce potential airborne dust.

Potential Hazardous Wastes Removed	**Recycled Products**
Mercury in sink traps	Lead counter weights from Hoods recycled
Mercury switches, thermostats and manometers	Mercury in bulbs and thermostats sent out as Universal
Radioactive contaminated transite from lab hoods	waste for recovery (other mercury wastes sent out as
PCB lighting ballasts	hazardous waste)
Mercury fluorescent bulbs	Numerous overhead doors, cranes, motors, AC/heating
Asbestos shingles, tiles, siding and pipe covering	units, office furniture, etc…
Underground fuel piping	Metals recovered for recycling
Freon from AC units	Concrete/masonry sent to the Borrows Pit (an on-site
Legacy wastes (lab chemicals, aerosol cans, etc…)	reclamation project *)

	Remaining components (plaster, wood, etc) sent out to a C&D yard.

* An outside vendor with a concrete crusher is occasionally hired to come in and crush the concrete. The resultant aggregate is used as roadbed material on the firebreaks and in parking lots. NOTE: The aggregate from this project displaced over 2700metric tons of virgin materials.

Cost Benefit Analysis

The following table indicates the three major waste streams, their disposition and disposal costs:

Waste Stream	Volume/Weight	Disposition	Cost	Total Cost
C&D	1091 metric tons	C&D landfill	($25/ ton)	($27,275)
Concrete/Masonry	2728 metric tons	Barrows Pit	$0	$0
Metals	9.6 metric tons	Metals Recycler	$33/ton	$317
Total	**3827.6 metric tons**			**($26,958)**

The total cost for disposal of this material was $26,958. If the material had not been segregated, the total cost would have been $95,690 (3827.6 tons*$25]. This relates to a cost savings of $68,632. If the reuse of the concrete is considered into the equation (savings of $67,000 for virgin aggregate - $23,000 for the crusher = $44,000), then the material recycling of the demolition project had a net savings of $112,623. In addition, this process saved approximately 1557 yd/3 of valuable C&D landfill void space and extended the life of the Towns' landfill. This innovative step-by-step process also produced undocumented savings in the form of less health and safety risks to the workers and less impact to the environment (i.e., all potential hazardous wastes were systematically removed prior to demolition).

The methodology and checklist format used for the demolition of buildings/structures at Brookhaven National Laboratory can easily be adopted for use at other DOE facilities.